

AMENDMENTS TO THE SPECIFICATION

Please amend the specification as indicated hereafter. It is believed that the following amendments and additions add no new matter to the present application.

In the Specification: [Use ~~strikethrough~~ for deleted matter (or double square brackets “[[]]” if the strikethrough is not easily perceptible, i.e., “4” or a punctuation mark) and underlined for added matter.]

Please amend the paragraph starting on p. 1, line 5 as follows:

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is related to U.S. Provisional Application entitled “Automatic Cross Connect Configuration in a DSLAM and Extensions for Class of Service and Scaling,” filed on October 2, 2000 and accorded Serial No. 60/237,148 (~~Atty. Docket 61606-8610; 2000-21, 22~~), which is hereby incorporated by reference, and to U.S. Provisional Application entitled “Systems and Methods for Automatically Configuring Cross-Connections in a Digital Subscriber Line Access Multiplexer (DSLAM),” filed on December 1, 2000 and accorded Serial No. 60/250,494 ~~(Atty. Docket 61606-8640; 2000-21, 22)~~, which is hereby incorporated by reference.

Please amend the paragraph starting on p. 7, line 10 as follows:

FIG. 1 illustrates a functional block diagram of one embodiment of a DSL system 20 for providing DSL-based services in which the systems and methods of the present invention may be employed. DSL system 20 includes residential subscribers 22, commercial subscribers 24, local digital subscriber line (DSL) loops 26, central offices 28, public switched telephone network (PSTN) 30, and service provider network 32. Subscribers 22 and 24 are coupled to a central office 28 via a local DSL loop 26. Central offices 28 are connected to PSTN 30 and service provider network 32.

Please amend the paragraph starting on p. 7, line 19 as follows:

DSL system 20 enables a residential subscriber 22 and/or a commercial subscriber 24 to receive traditional voice-frequency services, as well as, high-speed data services over the same DSL loop 26. A DSL loop 26 is a traditional twisted-pair of copper wires that extends between central office 28 and a residential subscriber 22 and/or a commercial subscriber 24. Traditional voice-frequency services are provided by central office 28 via PSTN 30, while high-speed data services are provided via service provider network 32.

Please amend the paragraph starting on p. 7, line 30 as follows:

In order to enable DSL-based services, residential subscribers 22 employ at their premises a filter 34, a telephone 36, a DSL remote transceiver unit 38, and a computer 40. Commercial subscribers 24 may employ at their premises a filter 34, a telephone 36, a DSL remote transceiver unit 38, a network hub [[42]]41, a computer 40, and a workstation 42. Although FIG. 1 differentiates between residential subscribers 22 and commercial subscribers 24, it should be understood that the systems and methods of the present invention are not dependent upon or limited by the type of subscriber receiving the DSL-based services.

Please amend the paragraph starting on p. 8, line 8 as follows:

Filter 34 may be any standard plain old telephone service (POTS) splitter or any similar device capable of separating voice-frequency traffic from high-speed data traffic provided on a DSL loop 26 carrying both. Filter 34 is coupled to DSL loop 26. In operation, filter 34 receives voice-frequency traffic and high-speed data traffic as input from DSL loop 26 and provides the voice-frequency traffic to telephone 36 and the high-speed data traffic to DSL remote transceiver unit 38. Telephone 36 may be any conventional or future telephone or any similar device capable of converting sounds, such as voice, into analog data and transmitting the analog data over a DSL loop 26. DSL remote transceiver unit 38 functions as a DSL modem that provides the high-speed data traffic to computer 40. In the commercial subscriber environment, DSL remote transceiver unit 38 is coupled to a hub [[42]]41, which supports a network of computers 40 and workstations 42. Computer 40 and workstation 42 may be any computer capable of receiving high-speed data traffic from a DSL loop 26. Those of ordinary skill in the art should understand that, although

telephone 36 and computer 40 and workstation 42 are represented by different elements in FIG. 1, this invention contemplates combining telephone 36 with computer 40 and/or workstation 42. For purposes of this invention, the important aspect is that, because DSL loop 26 carries both voice-frequency traffic and high-speed data traffic, filter 34 separates the voice-frequency traffic and the high-speed data traffic at the premises of residential subscriber 22 and/or commercial subscriber 24 to enable both voice services and high-speed data services.

Please amend the paragraph starting on p. 8, line 28 as follows:

In accordance with the systems and methods of the present invention, DSL system 20 may provide any of a number of DSL-based services to a residential subscriber 22 and/or a commercial subscriber 24 via DSL loop 26. For example, DSL system 20 may provide high-bit-rate digital subscriber line (HDSL) services. HDSL provides T1 data rates of 1.544 Mbits/sec over DSL loops 26 that are up to 3.6 kilometers in length. Generally, HDSL is a T1 service that requires no repeaters, but does use two DSL loops 26. In HDSL, voice telephone services cannot operate on the same DSL loop 26. HDSL services are generally not used for residential subscribers 22, but instead are used by the operator of central office 26 as feeder lines, interexchange connections, Internet servers, or private data networks to commercial subscribers 24.

Please amend the paragraph starting on p. 9, line 29 as follows:

It should be understood by one of ordinary skill in the art that the systems and methods of the present invention are not dependent on or limited by the type of DSL service provided to residential subscribers 22 and/or commercial subscribers 24. These are merely examples of common DSL services that may be implemented.

Please amend the paragraph starting on p. 10, line 12 as follows:

In operation, high-speed data traffic from service provider network 32 is received at central office 28 by DSLAM 44 via communications channels 50. Voice-frequency traffic is received at central office 28 by telephone switch 46 via communications channels 52. As described above, DSL system 20 provides both the voice-frequency traffic and the high-speed

data traffic from central office 28 to residential subscribers 22 and/or commercial subscribers 24 via DSL loops 26. DSLAM 44 enables the high-speed data traffic to bypass telephone switch 46. DSLAM 44 concentrates the high-speed data traffic and routes it to main distribution frame 48. Main distribution frame 48 receives the high-speed data traffic from DSLAM 44 and the voice-frequency traffic from telephone switch 46 and provides both types of traffic to communications channels 54 for subsequent delivery to residential subscribers 22 and commercial subscribers 24.

Please amend the paragraph starting on p. 10, line 27 as follows:

FIG. 3 illustrates the components of one embodiment of a DSLAM 44 in central office 28 of FIG. 2 for implementing the systems and methods of the present invention. DSLAM 44 includes an uplink interface 56, a switch concentration module (SCM) 58, a backplane interface 60, and a plurality of line cards 62. Uplink interface 56 is coupled to communications channels 50, which carry the high-speed data traffic from service provider network [[30]]32, and SCM 58. Line cards 62 are coupled to communications channels 54, which communicate with DSL loops 26 (FIG. 2), and backplane interface 60. Backplane interface 60 is coupled to SCM 58.

Please amend the paragraph starting on p. 11, line 8 as follows:

Backplane interface 60 may be a proprietary interface to line cards [[60]]62. In alternative embodiments, backplane interface 60 may be any type of interface to a wide-area transmission medium, such as a fiber-based (OC3), coaxial (DS3), or any other known or future type of wide-area transmission medium.

Please amend the paragraph starting on p. 11, line 12 as follows:

Each line card 62 includes a plurality of DSL ports 64. Each DSL port 64 corresponds to a DSL loop 26 connected to a residential subscriber 22 or a commercial subscriber 24.

Please amend the paragraph starting on p. 11, line 14 as follows:

In operation, high-speed data traffic from service provider network 32 (FIG. 1) is received at DSLAM 44 by uplink interface 56 via communications channels 50. Each communication channel 50 terminates at a link in uplink interface 56. The high-speed data traffic is then

transmitted to SCM 58 where it is transmitted to links in backplane interface 60. Backplane interface 60 provides the high-speed data traffic to DSL ports 64 in line cards 62 for subsequent delivery to residential subscribers 22 and commercial subscribers 24 over DSL loops 26.

Please amend the paragraph starting on p. 11, line 23 as follows:

Referring to FIGS. 4 – 6, in the preferred embodiment of the present invention, service provider network 32 (FIG. 3) is an ATM network. Various ATM standards and specifications exist for implementing various aspects of ATM networks. Although many of these aspects are known to one of ordinary skill in the art, they are introduced here for clarity and completeness. FIG. 4 illustrates an ATM transmission medium 66 for transmitting the high-speed data traffic on communications channels 50 and 54 data communications through DSLAM 44 (FIG. 2). Data is routed through an ATM network based on virtual path connections (VPCs) 68 and virtual channel connections (VCCs) 70. VPCs 68 and VCCs 70 exist across a node in the ATM network. A virtual path link (VPL) or a virtual channel link (VCL) can exist between connecting nodes in the ATM network. A VPC or VCC is an ordered list of pairs of VPLs or VCLs, respectively.

Please amend the paragraph starting on p. 12, line 4 as follows:

ATM data is transmitted through an ATM network as 53-byte cells. FIG. 5 illustrates the format of the 53-byte ATM cell at the user-network interface (UNI). Cell header [[70]]71 contains a logical address in two parts: an 8-bit virtual path identifier (VPI) 74 and a 16-bit virtual channel identifier (VCI) 76. The cell header 71 also contains a 4-bit generic flow control (GFC) 78, 3-bit payload type (PT) 80, and a 1-bit cell loss priority (CLP) indicator 82. The entire header 71 is error-protected by a 1-byte header error control (HEC) field 84.

Please amend the paragraph starting on p. 12, line 11 as follows:

FIG. 6 illustrates the format of the 53-byte ATM cell at the network node interface (NNI). The format is identical to the UNI format with two exceptions. First, there is no GFC 78 (FIG. 5). Secondly, the NNI uses the 4 bits used for GFC 78 at the UNI to increase the VPI 74 to 12 bits at the NNI as compared to 8 bits at the UNI.

Please amend the paragraph starting on p. 13, line 8 as follows:

At block 104, a default logical VPI/VCI address is obtained, which may be associated with communications channels 50 on uplink interface 56 (FIG. 3). The default logical VPI/VCI address may be stored within management software 100 in memory 88 or it may be provisioned based on information received from user interface 92.

Please amend the paragraph starting on p. 13, line 12 as follows:

At block 106, a first plurality of unique logical VPI/VCI addresses are defined based on a predefined set of rules for incrementing logical VPI/VCI addresses, which will be described below. The first plurality of unique logical VPI/VCI addresses may be associated with communications channels 54 on backplane interface 60 (FIG. 3).

Please amend the paragraph starting on p. 13, line 20 as follows:

At block 110, cross-connects are created between communications channels 50 and 54 by linking the first and second unique logical VPI/VCI addresses. Each of the cross-connects may be initialized to an autodown status. For example, in all known systems and methods, the cross-connects are typically administratively in an up or down status. In accordance with the systems and methods of the present invention, the automatically generated cross-connects are initialized to autodown, which signifies that the cross-connect has been automatically generated and does not have an association with a DSL port 64 or line card 62 (FIG. 3).

Please amend the paragraph starting on p. 13, line 28 as follows:

At blocks 112 and 114, a line card 62 is detected and information is received from line card 62. In the preferred embodiment, the information relates to (1) a slot number corresponding to DSL ports 64, (2) the number of DSL ports 64 associated with the line card 62, (3) the number of types of channels 54 (FIG. 3) associated with each DSL port 64, which defines the number of cross-connects for each DSL port 64, and (4) ATM traffic profile information for each channel 54.

Please amend the paragraph starting on p. 14, line 4 as follows:

Block 116 specifies that for each type of channel 54 indicated by line card 62, the following steps are performed. At block 118, one of the first and second plurality of unique logical VPI/VCI addresses are specified as a base logical VPI/VCI address for each channel based on the information from line card 62.

Please amend the paragraph starting on p. 14, line 8 as follows:

At block 120, each type of channel 54 for each DSL port 64 is associated with one of the first plurality of unique logical VPI/VCI addresses. At block 122, the state of each cross-connect corresponding to each of the first plurality of unique logical VPI/VCI addresses associated with each type of channel for each DSL port 64 is changed to up and traffic on each cross-connect is bound to the traffic profile specified by line card 62.

Please amend the paragraph starting on p. 14, line 13 as follows:

For example, a line card 62 in slot # 3 may call for one channel 54 with 24 DSL ports 64. Line card 62 may also call for unspecified bit rate (UBR) packet-based service. Based on this information, a base logical VPI/VCI address corresponding to VPI = 0 and VCI = 32 may be specified. Then the status of cross-connects corresponding to VPI = 0 and VCI = 32 through VPI = 0 and VCI = 55 are changed to up and the traffic on each is bound to UBR.

Please amend the paragraph starting on p. 14, line 19 as follows:

For a second example, a line card 62 in slot #8 may call for one channel 54 with 16 DSL ports 64 for carrying unspecified bit rate (UBR) packet traffic and another channel for carrying variable bit rate (VBR) voice traffic. Based on this information, a base logical VPI/VCI address corresponding to VPI = 0 and VCI = 32 may be specified for the packet channel and another corresponding to VPI = 1 and VCI = 32 may be specified for the voice channel. Then the cross-connects corresponding to VPI = 0 and VCI = 32 through VPI = 0 and VCI = 55 are allocated and the status of cross-connects corresponding to VPI = 0 and VCI = 32 through VPI = 0 and VCI = 47 are changed to up and the traffic on each is bound to UBR. The cross-connects corresponding to VPI = 1 and VCI = 32 through VPI = 1 and VCI = 55 are also allocated and the

status of cross-corresponding to VPI = 1 and VCI = 32 through VPI = 1 and VCI = 47 are changed to up and the traffic on each is bound to VBR.

Please amend the paragraph starting on p. 15, line 29 as follows:

In one embodiment, management software 100 includes an uplink interface data module 130, cross-connect data module 132, backplane interface data module 134, VCL data module 136, a line card data module 138, an auto-configuration data module 140, and a DSL port data module 142 (FIG. 7).

Please amend the paragraph starting on p. 16, line 16 as follows:

Backplane interface data module 134 may include information related to backplane interface 60, such as identifiers for each of the links for communications channels 54 in backplane interface 60 and VPI/VCI pairs for each channel associated with each of the links. FIG. 11 illustrates a backplane interface data structure 166, which may be used for implementing a further portion of management software 100 in FIG. 7. Backplane interface data structure 166 may include [[a]]an “interface ID” variable 168, a “max VPI” variable 170, a “max VCI” variable 172, a “status” variable 174, and an “other parameters” variable 176.

Please amend the paragraph starting on p. 16, line 24 as follows:

Uplink interface data module 130 may include information related to uplink interface 56, such as identifiers for each of the links for communications channels 50 in uplink interface 56 and VPI/VCI pairs for each channel associated with each of the links. FIG. 12 illustrates an uplink interface data structure 178, which may be used for implementing another portion of management software 100 in FIG. 7. Uplink interface data structure 178 may include [[a]]an “interface ID” variable 180, a “max VPI” variable 182, a “max VCI” variable 184, a “status” variable 186, and an “other parameters” variable 188.

Please amend the paragraph starting on p. 17, line 14 as follows:

FIGS. 14a – 14c illustrate a ~~cross-connect~~ cross-connection table 210 which may be used for implementing another portion of management software 100 in FIG. 7. Cross-connect table

210 may include a list of “uplink interface:VPI:VCI” values 212 associated with a list of “backplane interface:VPI:VCI” values 214 and a related list of “status” values 216. Values 212 may be VPI/VCI addresses corresponding to a first set of cross-connections which are calculated based on a default logical VPI/VCI address associated with the VPI/VCI address for communications channels 50. Values 214 may be VPI/VCI addresses corresponding to a second set of cross-connections which are associated with VPI/VCI addresses for each link on backplane interface 60.

Please amend the paragraph starting on p. 18, line 15 as follows:

Auto-configuration data module 140 may include information related to a default logical VPI/VCI address associated with the VPI/VCI addresses for communications channels 50. FIG. 16 illustrates an auto-configuration record 232, which may be used for implementing another portion of management software 100 in FIG. 7. Auto-configuration record 232 may include [[a]]an “interface ID” variable 234, a “channel” variable 236, a “base VPI” variable 238, and a “base VCI” variable 240.

Please amend the paragraph starting on p. 18, line 21 as follows:

FIG. 17 illustrates a system 250 in which an alternative embodiment of SCM 58 of FIG. 7 may be implemented according to the systems and methods of the present invention. System 250 comprises a network-side ATM node 252, user-side ports 254, and an ATM interface 256. ATM interface 256 is coupled to ATM node 252 and the user-side ports 254. ATM node 252 provides multiple communications channels to ATM interface 256 and user-side ports 254 are also configured to receive multiple communications channels. Similar to communications channels 50 and 54 with respect to system 20, there may be multiple types of channels associated with the communications channels. ATM interface 256 comprises SCM 58 (FIG.3).